

# Topological relationships between spatio-temporal history of moving points in a primitive space



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## Outline

- Background and motivations
- Spatio-temporal relationships in a temporal space
- Spatio-temporal relationships of two static points in a 1D space
- Generalization of relationships in a primitive space
- Example of use
- Spatio-temporal relationships of two moving points in a 1D space
- Conclusion and further research

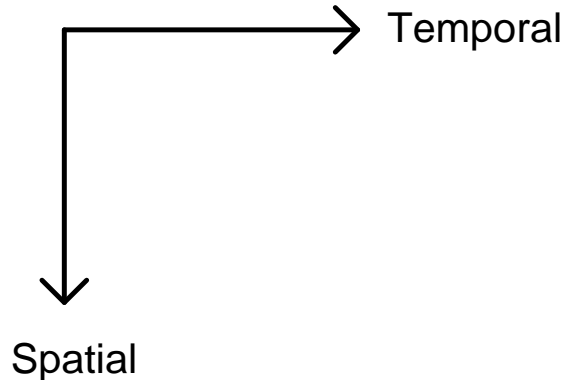
## Background and motivations

- Thesis research
- Spatio-temporal reasoning
- Data acquisition techniques (e.g. on-board GPS)
- Spatio-temporal data
- Not yet standard spatio-temporal functionalities
- Increase of complexity when considering time
- Difficulty of representation

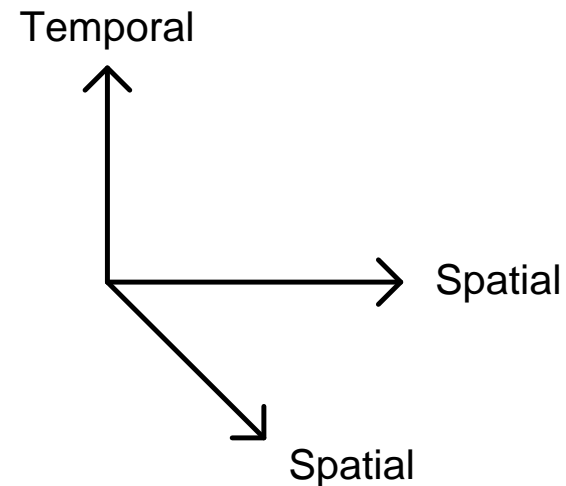
## Spatio-temporal relationships in a temporal space

- Temporal space :

**Representation in a common framework of temporal (Allen's time intervals) and spatial (topological) relationships.**



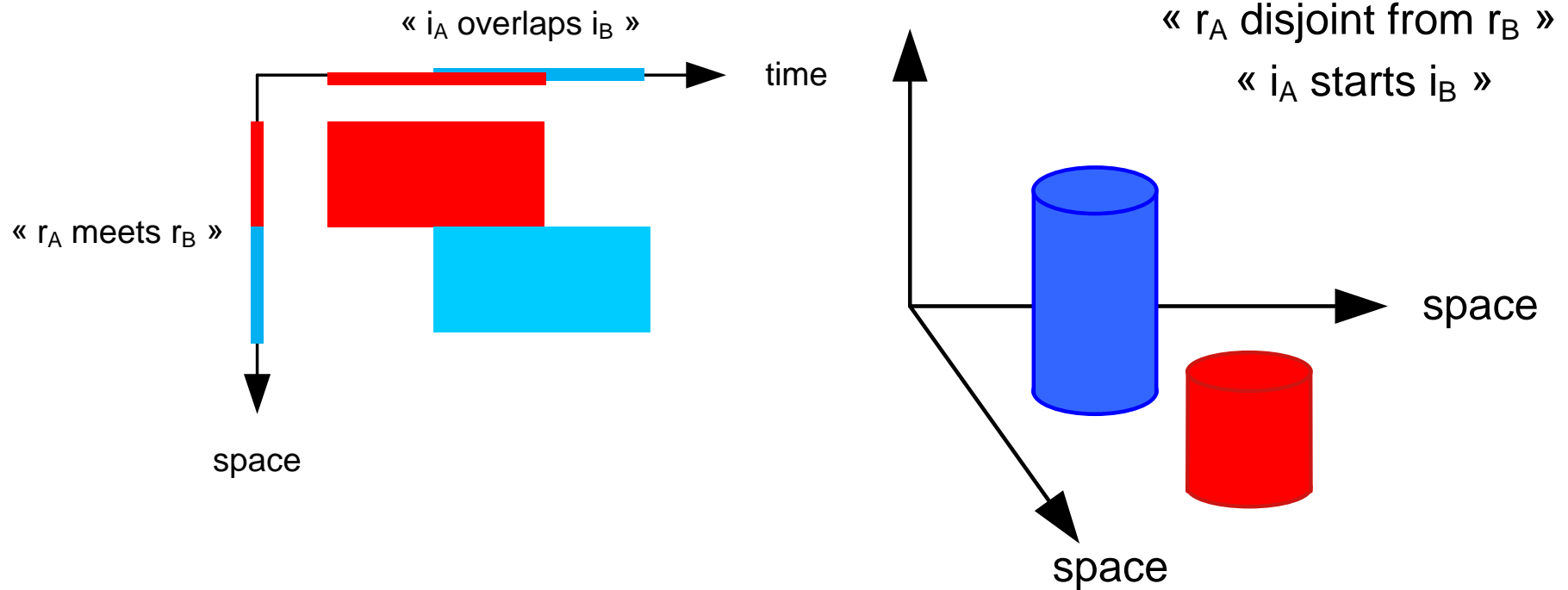
2D Temporal space



3D Temporal space

# Spatio-temporal relationships in a temporal space

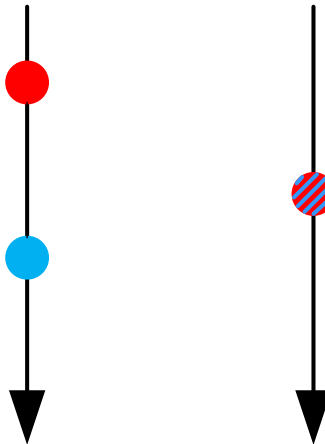
## Crossing relationships



## Static points in a 1D space

Possible spatial topological relationships between two points in a 1D space

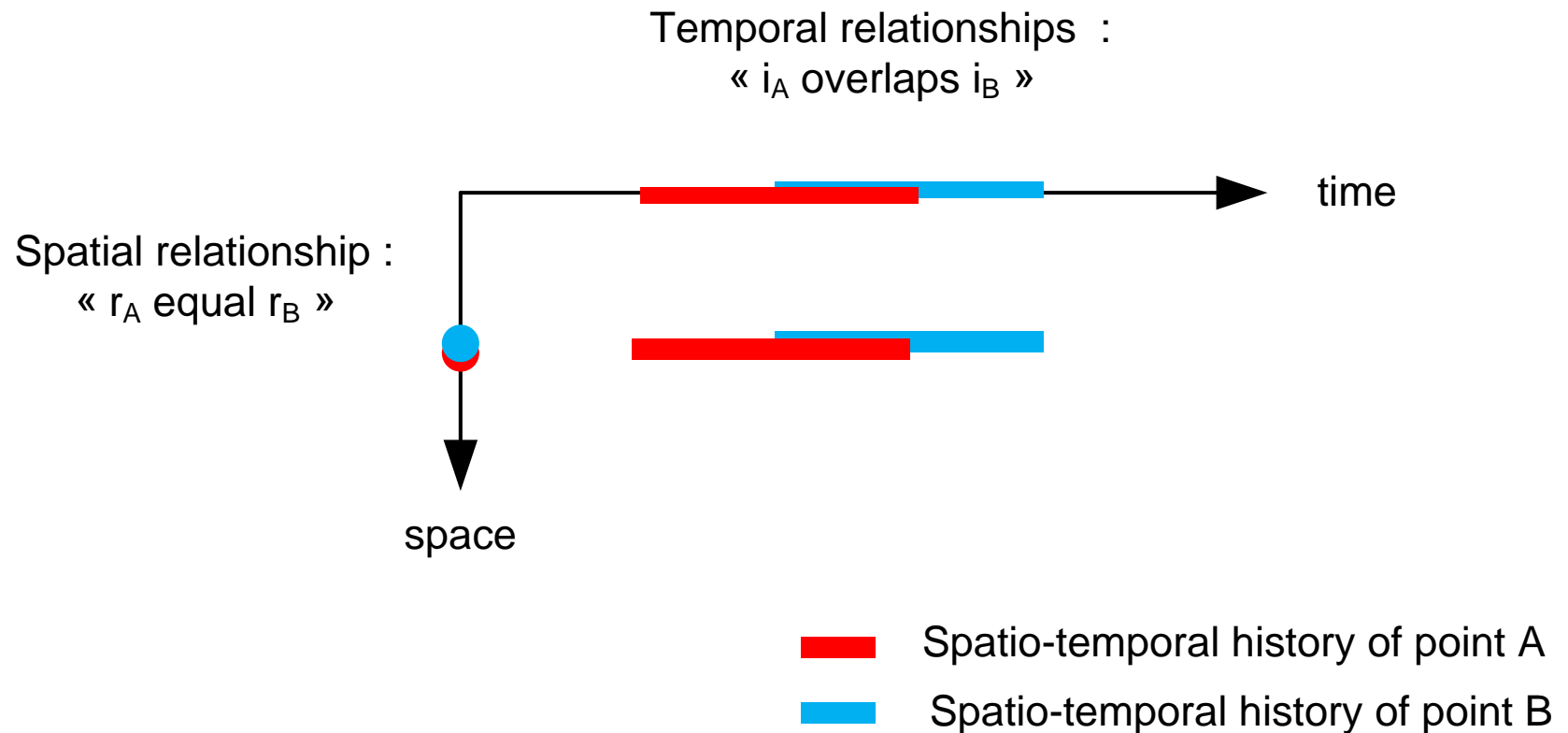
1D linear space

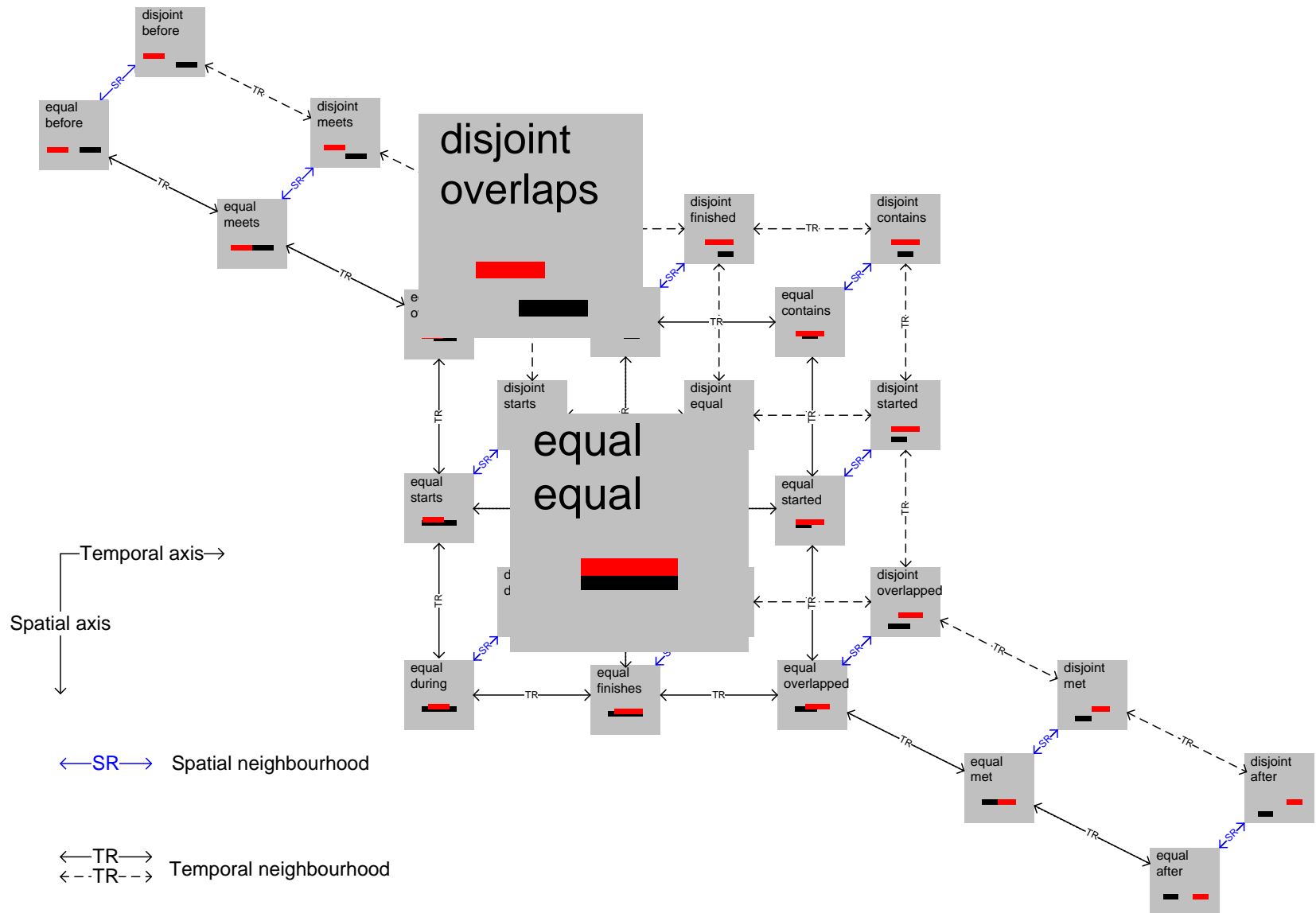


disjoint

equal

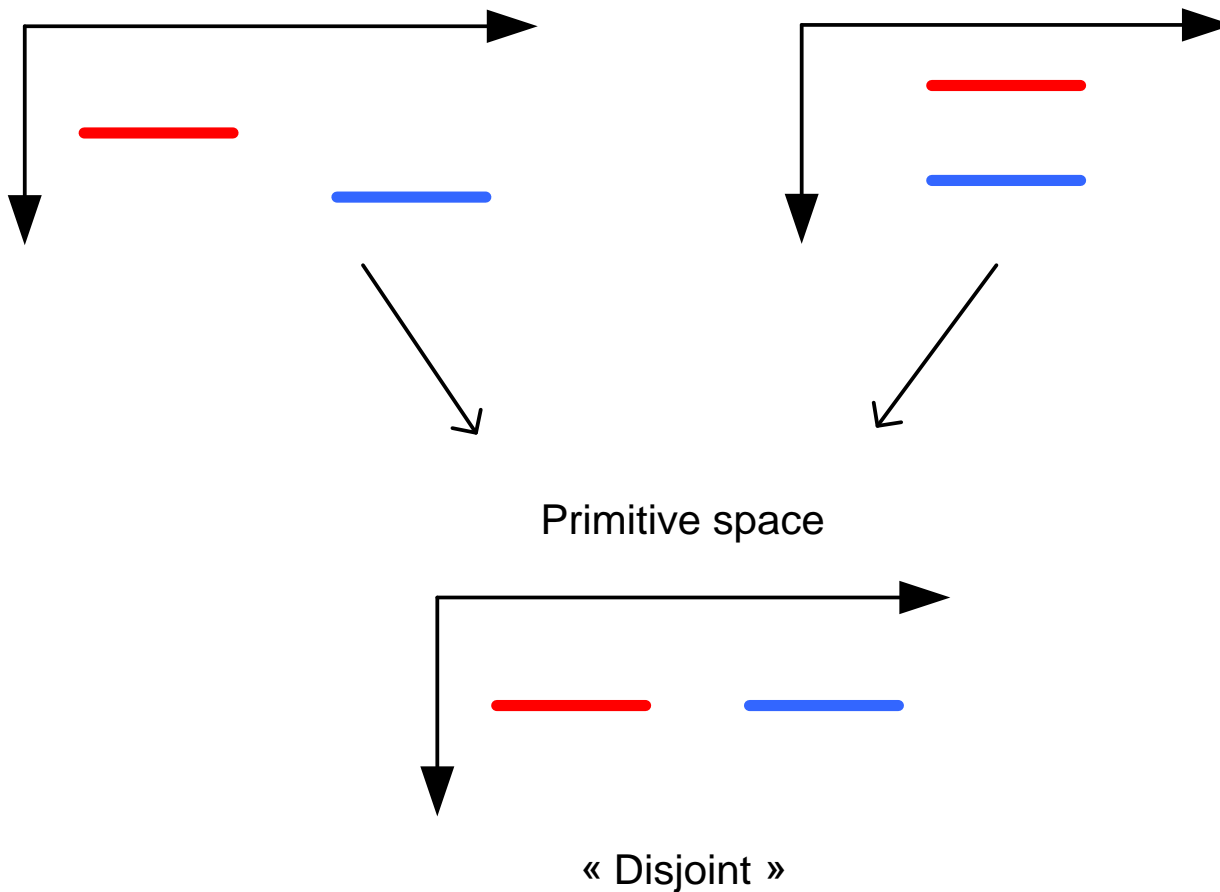
## Static points in a 1D space

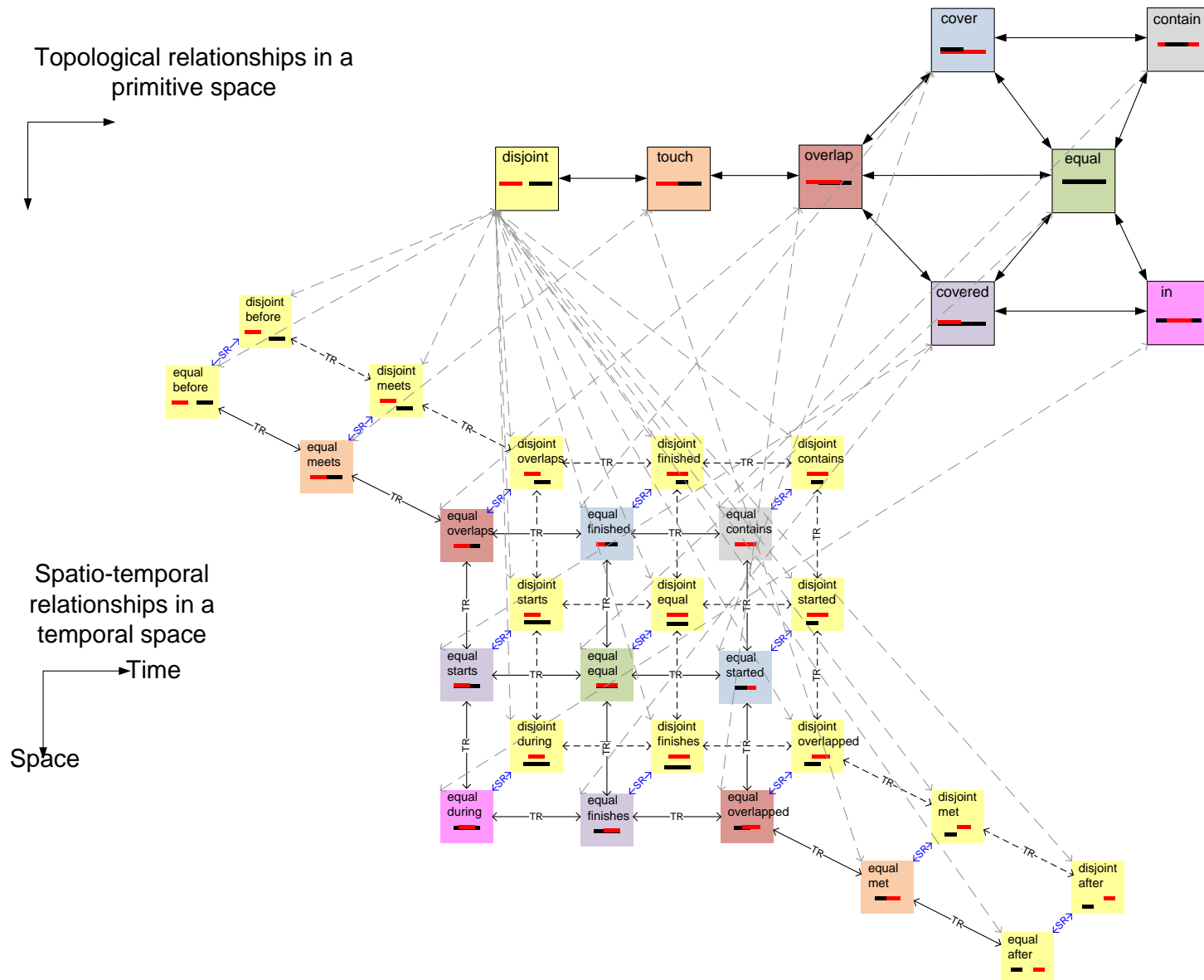






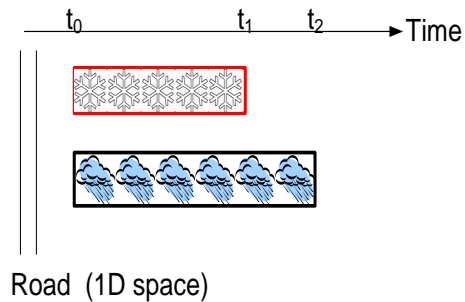
## Generalization in a primitive space



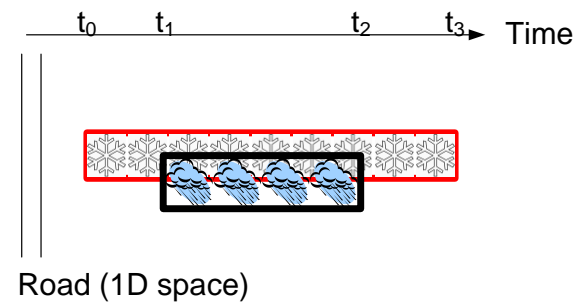


## Example of use

Real world



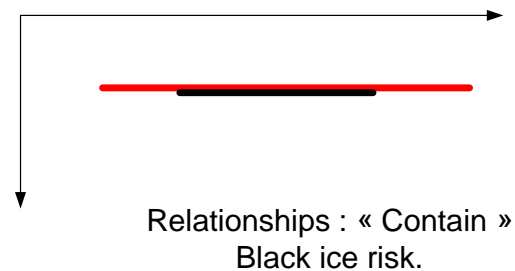
Real world



Temporal space

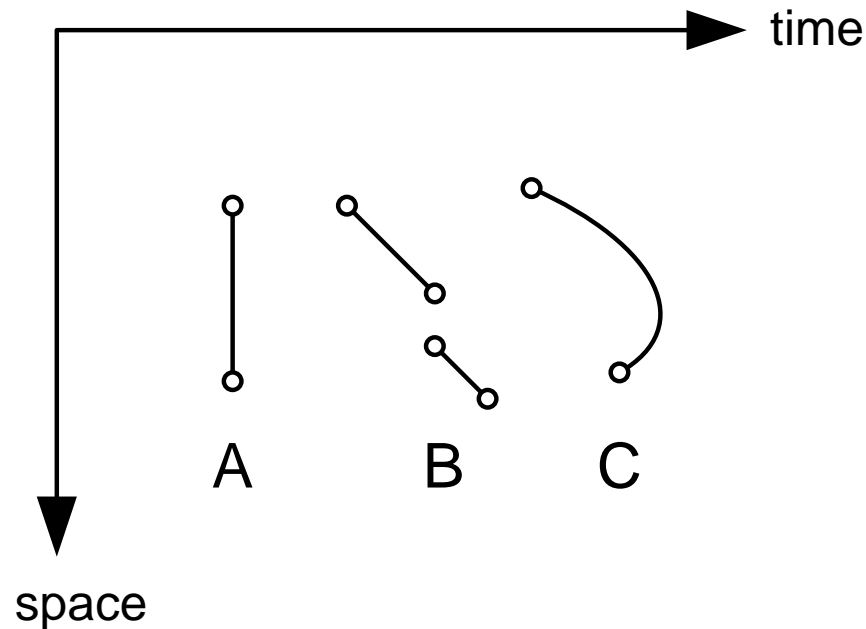


Primitive space



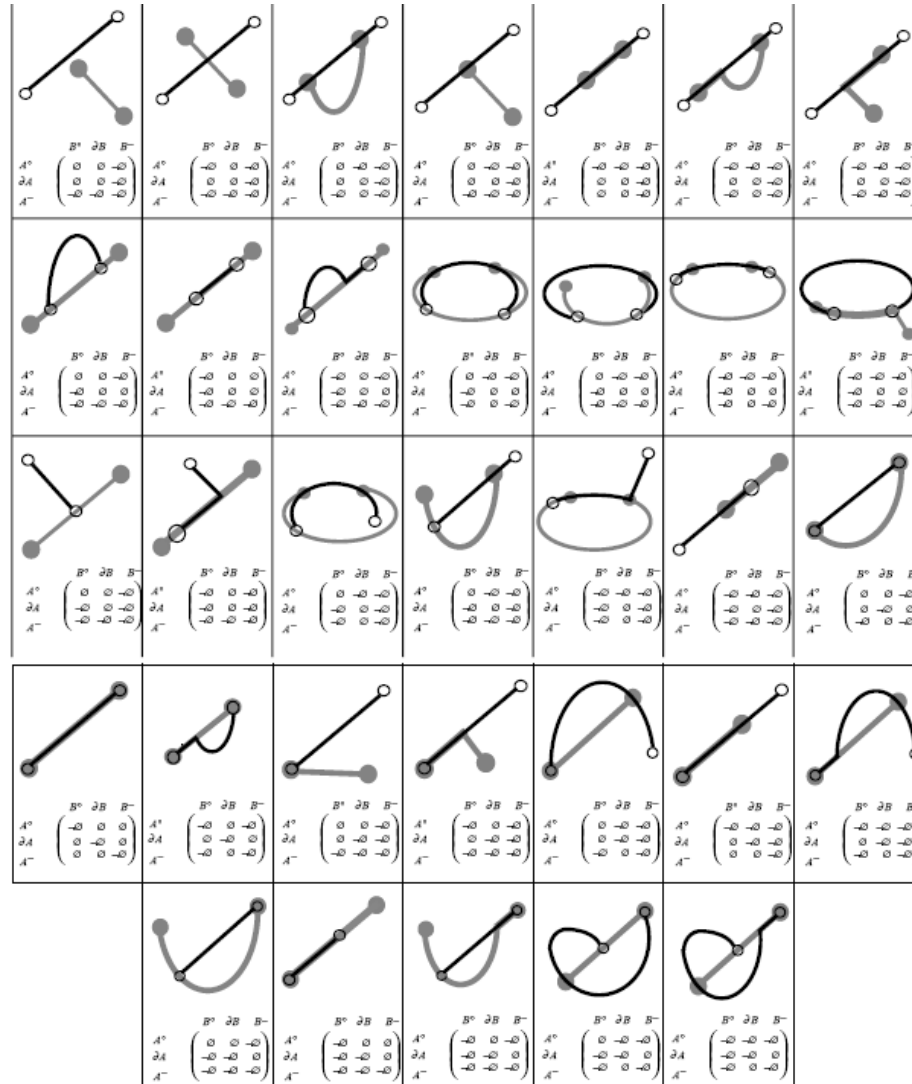
## Moving points in a 1D space

### Working hypothesis

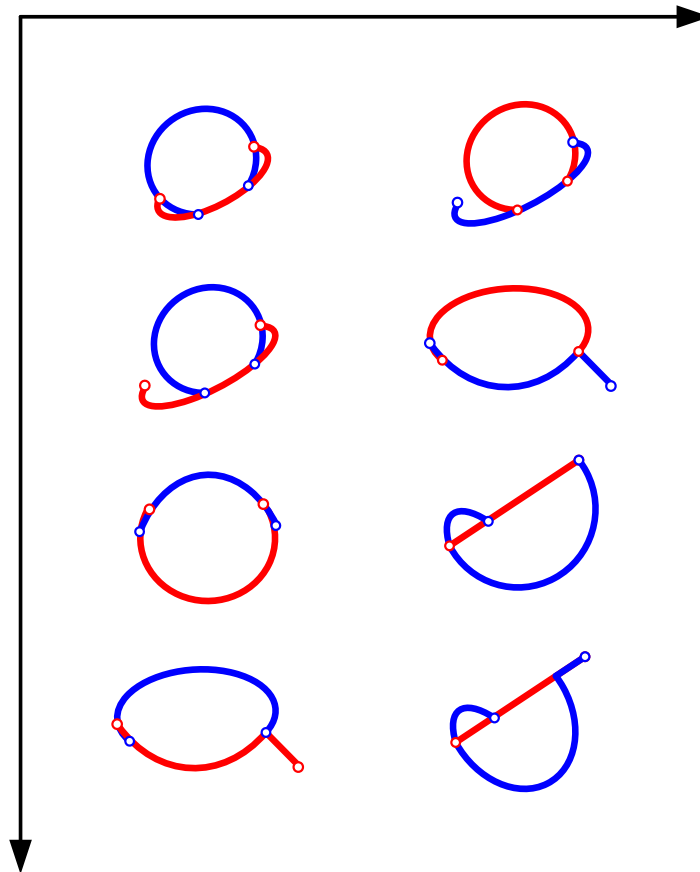


A instantaneous movement  
B no continuous movement  
C go back in the past





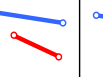
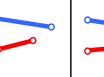
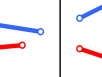
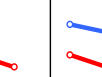
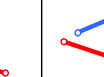
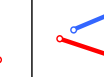
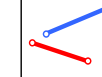

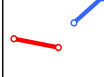



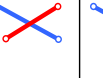
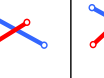
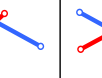
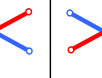
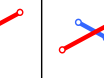
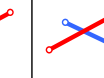
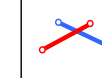


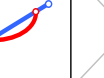


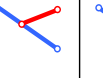
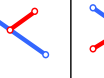







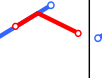








# Moving points in a 1D space


























## Moving points in a 1D space






















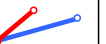
































Impossible topological relationships  
between two spatio-temporal histories

	before	meets	overlaps	finished	contains	started	equal	starts	during	finishes	overlap- ped	met	after
													
													
													
													
													
													
													
													
													

	before	meets	overlaps	finished	contains	started	equal	starts	during	finishes	overlap- ped	met	after
													
													
													
													
													
													
													
													
													
													



	before	meets	overlaps	finished	contains	started	equal	starts	during	finishes	overlap- ped	met	after
													
													
													
													
													
													
													

	before	meets	overlaps	finished	contains	started	equal	starts	during	finishes	overlap- ped	met	after
													
													
													
													
													
													

## Conclusion and further research

- Description of all spatio-temporal relationships between two static points in a 1D space.
- Generalization in a primitive space.
- Description of all topological relationships between two spatio-temporal history of two moving points.
- Possible way of simplification for spatio-temporal analysis.
- Extension of the to regions, ...
- Use of more descriptive relationships than the topological ones.
- Test of pertinence on remaining information after generalization.

**Thanks for attention.**

**Questions ?**